Post graduate Diploma in Medical Laboratory Technology
(One Year course)

P.G.D.M.L.T

Academic Year: 2023-24

Sumandeep Vidyapeeth Deemed to be
University, Piparia, Waghodia,
Vadodara

P.G. DIPLOMA IN MEDICAL LABORATORY TECHNOLOGY (PGDMLT)

Learning Objectives: *The main objective of the course is to impart the knowledge of apparatus, units, equipment, analytical skills development, and Laboratory investigations in the medical/clinical laboratory in Hematology, Pathology, Histopathology, Blood banking, Microbiology and Biochemistry subjects. The students are also given basic training in Aseptic techniques, safety precautionary measures, quality control parameters and latest automation in* all subject area focusing their complete development in the field of Laboratory sciences.

Program outcomes

The PGDMLT course provides learning in the prevention, diagnosis, and treatment of diseases in patients through clinical laboratory investigations. After successfully completing this course, candidates can perform activities such as handling and analysing human clinical specimens like Blood, Sputum, microbiological specimens body fluids and other clinical samples assisting the concerned doctor in the treatment of diseases and detecting the presence or absence of certain microorganisms in the patient's body.

Ethics and accountability

Students will understand core concepts of clinical ethics and law so that they may apply these to their practice as healthcare service providers. Program objectives should enable the students to:

- Describe and apply the basic concepts of clinical ethics to actual cases and situations.
- Recognize the need to make health care resources available to patients fairly, equitably and without bias, discrimination or undue influence.
- Demonstrate an understanding and application of basic legal concepts to the practice
- Employ professional accountability for the initiation, maintenance and termination of patient-provider relationships.
- Demonstrate respect for each patient's individual rights of autonomy, privacy, and confidentiality

Commitment to professional excellence

The student will execute professionalism to reflect in his/her thought and action a range of attributes and characteristics that include technical competence, appearance, image, confidence level, empathy, compassion, understanding, patience, manners, verbal and non-verbal communication, an anti-discriminatory and non-judgmental attitude, and appropriate physical contact to ensure safe, effective and expected delivery of healthcare.

Duration of the course
Duration of the course is 1 year

Medium of instruction:
English shall be the medium of instruction for all the subjects of study and for examination of the course.

Eligibility Criteria : A Candidate for admission to the Post graduate Diploma in Medical Laboratory Technology must have passed the B Sc. Degree Examination of any U.G.C. approved University with Bachelor in Life sciences/Medical Laboratory Technology or Medical Technology / Microbiology/ Bio Chemistry/ Zoology / Botany/ Chemistry / Bio- Technology / Environment Science / Genetics / Bioinformatics / B. Sc. (Home Science) /B. Sc. (Industrial Microbiology).

Rules and Regulations

1. The course of study for the Post graduate Diploma in Medical Laboratory Technology shall be a full time course and its duration shall be of one academic year.
2. A candidate who has passed an equivalent examining body and is seeking admission to the Institute recognised by this University shall not be admitted without producing on eligibility certificate from the Sumandeep Vidyapeeth deemed University.
3. To become eligible to appear in the final examination conducted by Sumandeep Deemed University.

A. Candidate has to keep two terms at the Institute recognised for teaching the course of studies in Medical Laboratory Technology by the university.

B. The candidate has to keep the minimum attendance of 80% in Theory, Practical and laboratory postings in different departments of hospital separately.

C. Candidate has to obtained at least 45 % marks in aggregate of all the papers in the internal tests and External examination conducted by the University.

4. A candidate desirous of appearing at the Examination for the P.G Diploma in Medical Laboratory Technology must forward his exam application in the prescribed format accompanied by a Certificate of attendance to the Registrar through the Principal or Head of the institute on or before the date prescribed for the purpose under the ordinance/s.
5. For the purpose of deciding final result at this examination, the ratio between the Internal assessment and final University examination shall be 20:80 for both theory &

practicals. For the purpose of internal assessment the college will conduct at least one test in each term.

6. The final examination for the P.G. Diploma in Medical Laboratory Technology shall be held at the end of the academic year.

7. The Diploma Medical Laboratory Technology shall not be conferred upon a candidate unless he/she has passed in all the subject of the theory examination and the practical's in accordance with the provisions of relevant regulations.

8. The subject of examination for the Diploma Medical Laboratory Technology will be as under.

Course of Instruction:

Course Name	**Course Code**	**Theory (In hrs.) (Class and lab)**	**Practical (In hrs.) (Clinical)**
Hematology & Histopathology	PGDMLT-101	80	40
Clinical Biochemistry	PGDMLT-102	80	40
Clinical Pathology& Blood Banking	PGDMLT-103	80	40
Microbiology & Immunology	PGDMLT-104	80	40
		320	**160**
Internship (Integrated Practice during academic year)			520
Total		320	680

*The clinical internship will consist of internship carried out in clinical laboratories of different departments of laboratory medicine in hospital.

P.G. DMLT-Examination System and Marks distribution: Theory and Practical

Course Code	Subject	Duration ofExam (hours)	Distribution of marks		Total
			University exam	Internal assessment	
PGDMLT-101	Hematology & Histopathology	3 hours	80	20	100
PGDMLT-102	Clinical Biochemistry	3 hours	80	20	100
PGDMLT-103	Clinical Pathology& Blood Banking	3 hours	80	20	100
PGDMLT-104	Microbiology & Immunology	3 hours	80	20	100
PGDMLT-105(P)	Practicals Microbiology, Pathology and Biochemistry	3 days	240	60	300
Internship			**100**	**-**	**100**
	Total		**660**	**140**	**800**

Practical exams will be conducted for each of Pathology, Microbiology & Biochemistry practical separately for 3 days.

Internal: 20 marks and External: 80 marks for each of Pathology, Microbiology and Biochemistry Practical.

The evaluation of internship will be based on submission of brief report and its presentation.

9. STANDARD OF PASSING

(A) To pass the P.G. Diploma in Medical Laboratory Technology Examination, a candidate must obtain at least 45% marks in each paper/practical/oral at the University Examination as also in thetotal of the internal assessment and the University Examination.

(B) AWARD OF CLASS:

(1) The successful candidates who obtain at least 50% or more but less than 60% marks in the total of internal assessment & the University examination will be place inSecond Class.

(2) The successful candidates who obtain at least 60% or more but less thann70% marks in the total of Internal assessment & the University examination will be place in FirstClass.

(3) The successful candidates who obtain at least 70% or more marks in the total of internal assessment & the University examination will be declared to have passed the examination in First Class with Distinction.

(4) Exemption: A candidates failing the examination but securing 45% marks in a theory paper/practical may at his option be exempted from appearing again in that subject at the subsequent examination and will be declared to have passed the examination when he passes in all the remaining theory papers/practicals in accordance with the provisions of (i) above A candidates who has refused once to avail himselfof the exemption earned by him in any paper/practical cannot claim it on a subsequent occasion. Candidates passing the examination in compartments in the manner herein provided for, shall not be eligible for a scholarship awarded at the examination or for the awardof a class.

PGDMLT-101: Hematology & Histopathology

Course Outcome:

The students will gain knowledge about basics of blood collection and use of blood for diagnosis. This subject will also give knowledge about histological and cytological studies of various samples and its importance in diagnosis.

Unit-1

Vein puncture

Instruments used in hematology

Common anticoagulants and their use

Composition of blood cellular elements, functions of blood

Unit-2

Estimation of Hemoglobin

Methods and counting of red blood cells, white blood cells, platelets and reticulocytes.
packed cell volume, blood indices, Estimation of erythrocyte sedimentation rate.

Unit-3

Preparation of blood films, staining methods and preparation of different stainsand diluting fluids
Study of blood smear examination for red blood cells, different white blood cells, normal and abnormal cells, platelets, and parasites.

Unit-4

Blood coagulation and haemostasis

Bleeding disorders and their laboratory investigations Basic tests for coagulopathy – BT, CT, PT, APTT.

Sickling tests, red cell fragility test and LE cell test. Foetal Hemoglobin

Estimation and Hemoglobin electrophoresis.

Unit-5

Laboratory diagnosis approach on Anemias, Leukemias,

Quality control in Hematology

Bone Marrow Examination

.Basics of automated Blood Cell counters

Unit: 6. Histopathology and Cytology

Basic concepts of different mammalian tissues and their histological structure.

Different human organs and their gross and histological structure and functions.

Handling Biopsy Specimen

Instruments in Histopathology

Fixation & common fixatives

Tissue processing: dehydration, clearing, embedding, methods of tissue

processing: automated & manual, Preparation of block.

Methods in common use for decalcification
recognition and correction of faults in section cutting
Preservation of slides and blocks

Unit: 7 Histopathology and Cytology

The manipulation and use of microtomes, Microtome knives and methods of

sharpening. Paraffin block, section cutting, picking up sections, drying

sections,

Staining of tissue sections, preparation of different stains, staining methods

for Haematoxylin & Eosin, Reticulin, PAS, Van-Gieson, Massion's

trichrome, Lipid & Mucin stains & Perl's stain.. Cytochemistry &

immunohistochemistry.

Mounting,

Frozen section apparatus: a theoretical knowledge of its application,

construction and use.

Diagnostic Cytology: preparation of smears and Papanicolaou stain & MGG staining of different body fluids.

Unit-8 Histopathology and Cytology

Fine Needle Aspiration cytology & exfoliative cytology & Buccal Smear examination.
Quality control in Histopathology

PGDMLT- I02 : CLINICAL BIOCHEMISTRY

Course Outcome:

Students will get detailed information about basics of biochemistry, various instrumentation techniques used in laboratories and importance of biomolecules for diagnosis of human diseases.

Unit:1 Introduction & General aspects

Introduction to Clinical Biochemistry, Study of weights, volumes and Units, Inter-conversion of units, Measurements,

Preparation of solution, Normal range

Different anticoagulants used in Clinical Biochemistry, its application and Mechanismof action.

Hazards in the Laboratory.

Unit:2 Instrumentation

Automation in Clinical Biochemistry laboratory

Electrophoresis, Chromatography, Colorimeter, Spectrophotometer, ELISA, RIA,Flame photometer

Unit:3 General Biochemistry of Carbohydrates

Classification, Boimedical importance, properties (chemical & physical)

Carbohydrate Metabolism (In brief) : Glycolysis, TCA, HMP shunt, Regulation ofblood sugar, GTT, Diabetes

Unit:4 General Biochemistry of Proteins

Amino acids, Peptides, Classification & Properties of Plasma proteins, Immunoglobulins,

Protein metabolism : Transamination, Deamination, Urea cycle, Phenyl ketonuria, Alkaptonuria.

Unit:5 General Biochemistry of Lipids

Lipids: Definition, Classification, Properties, Phospholipids.

Lipid metabolism : Cholesterol, Lipoproteins, VLDL, LDL, HDL, Atherosclerosis,Ketosis, Lipid Profile

Unit:6 Nucleic acids

Nucleotides : Nucleic acids, Functions (In Brief), Purine catabolism, Uric acid: Formation, Estimation, Interpretation, Gout

Unit:7 Hemoglobin

Hemoglobin structure and Thalassemia

Hemoglobin : Synthesis (In brief) Porphyrias, Heme breakdown, Bilirubin, Jaundice,Lab. diagnosis

Unit:8 Enzymes

Enzymes : Definition, Classification, Factors affecting enzyme activity, Inhibition, Diagnostic use of Enzyme

Unit:9 Minerals & Vitamins

Minerals : Calcium, Iron, Phosphorus, Iodine, Sodium & Potasium.

Vitamins (In brief) : A,D,E, K,B12,Folic acid & Vitamin C (In brief)

Unit:10 Body Function Test

Liver Function tests: Introduction, function of liver, type of investigations carried out, normal range and interpretation of results

Renal function tests: Functions of kidneys, Various renal function tests including clearance tests and interpretation of results.

Thyroid function tests: Estimation of T-3, T-4, TSH, Interpretation of results. pH, Blood buffers, Acid-base balance, Anionic gap
Quality Control: Internal and External

PGDMLT-103: **Clinical Pathology & Blood Banking**

Course outcome: The students will get detailed knowledge regarding various fluids produced in human body, their collection and methodologies utilized for its analysis They also learn knowledge regarding methods of blood collection and aspects of transfusion. In addition, they will also gain knowledge of different immunological reactions.

Unit-1

- Urine Examination: Physical, Chemical and Microscopic Examination
- Stool examination : Gross, chemical & microscopic Examination
- CSF Examination
- Semen examination

Unit-2

Examinations of other Body fluids – Pleural, peritoneal & pericardial fluid, Broncho alveolar lavage fluid, hydatid cyst fluid, Synonial fluid.

Quality control in Clinical Pathology

Unit-3 Blood Banking

- Immunohematology of red cell and blood group systems
- Computerized record keeping of Blood Bank
- Methods of ABO and Rh blood grouping,
- Reverse grouping
- Apparatus used in blood banking, its care and cleaning

Unit-4

- Screening of a blood donor, tapping of blood donor
- Cross matching tests
- Storage of blood and its components
- Coomb's test
- Blood component therapy

Unit-5

- Antibody titrations
- Blood transfusion reactions
- Detect the time when to discard blood in Blood Bank
- Quality control in Blood Banking

PGDMLT-104: Microbiology and Immunology

Course outcome: Students will acquire knowledge about pioneers in the field of microbiology, microorganism and methods for their isolation and identification. In addition, they will also understand features fungi, parasites and viruses infecting human. The students will also gain knowledge about functioning of immune system and clinical and applied aspect of microbiology.

Unit 1: HISTORICAL ASPECTS OF MICROBIOLOGY

History and Pioneers in Microbiology: Contributions of Antony Van Leeuwenhoek, Louis Pasteur, Joseph Lister, Paul Ehrlich, Robert Koch and Noble Laurette in the field of Microbiology.

Unit 2: MORPHOLOGY

Microscopy, Stained preparation, Size & Shape

Morphology of bacteria: Structures of a bacterial cell and their functions

Physiology of Bacteria: Nutrition, Gaseous requirement, temperature requirement and other growth requirements

Unit 3: GENERAL MICROBIOLOGY

Sterilization and disinfection

Culture Media

Culture Methods

Identification of Bacteria: biochemical tests

Antibiotic sensitivity testing

Unit 4: IMMUNOLOGY

Immunology

Infection, Immunity, Antigen, Antibody,

Antigen-Antibody reactions (General features, Precipitation, Agglutination, Complement fixation test,Immunofluorescence, Radio Immunoassay, ELISA),

Complement system,

Hypersensitivity

Unit 5: SYSTEMIC MICROBIOLOGY

Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Corynebacteria, Clostridia, Coliforms, Proteus, Salmonella, Shigella, Vibrio, Pseudomonas, Haemophillus,

Mycobacteria, Spirochaetes

Unit 6: MYCOLOGY

Morphological Classification of fungi

Laboratory diagnosis of Fungal Infections

Unit 7: PARASITOLOGY

Morphology, life cycle, laboratory diagnosis of following parasites:

Protozoa:

Entamoeba, Giardia, Trichomonas, Leishmania, Plasmodium

Unit 8: PARASITOLOGY

Helminthology

Cestodes:

Taenia, Echinococcus

Nematodes:

Trichuris, Ancylostoma,

Ascaris, Enterobius, Wuchereria bancrofti(filaria)

Unit 9: VIROLOGY

General Properties of Virus: Morphology, Replication & cultivation of viruses

- Disease caused, Laboratory diagnosis & prevention of
- Hepatitis viruses
- HIV, Coronavirus

Unit 10: CLINICAL & APPLIED MICROBIOLOGY

- Collection, Transportation & Culture of
- Sputum and other respiratory specimens
- Urine
- Faeces
- Blood
- CSF and other body fluids
- Hospital-acquired infections & Laboratory Hazards
- Disposal of Biomedical waste

- Quality control in Diagnostic Microbiology
- Automation in Diagnostic Microbiology

List of Practials/skills

1.Pathology:
Students should be able to perform:

Haematology :

1. Microscopy
2. Collection of Blood
3. Preparation of bulbs for collection
4. Blood cell counter
5. Estimation of Hemoglobin
6. RBC count
7. PCV & RBC indices
8. Platelet count
9. Total WBC count
10. Differential count
11. Peripheral smear
12. Reticulocyte count
13. ESR
14. Sickling tests
15. Bleeding time & Clotting time

Clinical Pathology
1. Urine Exam. R & M
2. Stool R & M
3. Semen examination R & M
4. CSF Exam. R & M

Blood Banking
1. Blood Group
2. CM Tests
3. Du Tests
4. Comb's Tests,
5. Antibody Tests

Histopathology & cytology

Must acquire
1. Preparation of fixatives
2. Haematoxylin and eosin

Nice to acquire:

1. Logging of tissue processing
2. Paraffin embedding
3. Section cutting
4. Staining
5. Mounting
6. Pap Stain.

2. Biochemistry:
Students should be able to perform:
Must acquire
1. Preparation of standard solution, molar solution and other reagents
2. analysis of normal and abnormal urine
3. Estimation of blood /serum glucose by various methods
4. GTT
5. Estimation of total protein and A/G ratio
6. Electrophoresis of plasma proteins
7. Electrophoresis of lipoproteins
8. Estimation of total cholesterol and its fractions
9. Estimation of calcium
10. Estimation of phosphorous
11. Estimation of Creatinine
12. Estimation of urea
13. Estimation of uric acid
14. Estimation of AST
15. Estimation of ALT
16. Estimation of alkaline phosphatase
17. Estimation of Bilirubin , direct , total
18. Auto analyzers
19. Electrolyte analyzer
20. Arterial blood gas analyzer
21. Chemiluminance equipment
22. Spectrophotometer

Nice to acquire:
1. Estimation of iron and TIBC
2. Chromatography

3. Microbiology:
Students should be able to perform:

Bacteriology

1. Aseptic practices in laboratory and safety precautions.
2. Preparation and pouring of media – Nutrient agar, Blood agar, Mac Conkey agar,Sugars, Serum sugars, TSI, Sabouraud dextrose.
3. Operation of autoclave, hot air oven, distillation plant, filters like Sietz and membraneand sterility tests.
4. Washing and sterilization of glassware (Plugging and packing)
5. Disposal of contaminated materials like cultures.
6. Quality control of media, reagents etc.
7. Care and maintenance of common laboratory equipments like water bath, centrifuge,refrigerators, incubators, etc.
8. Performance of antimicrobial suceptibility testing e.g. Kirby-Bauer,

9. Collection of specimens for Microbiological investigations such as Blood, Urine, Pus(Swabs),
10. Identification of Bacteria of Medical Importance upto species level
11. Preparation of stains viz. Gram, Ziehl Neelsen (ZN) etc. and performing of staining.
12. Care and operation of Microscopes viz. Light and Fluorescent microscopes.
13. Preparation, examination, and interpretation of direct smears from clinical specimens, viz.Sputum for AFB: ZN, Slit smears for *M. leprae* by modified ZN staining,
14. Quantitative analysis of urine by pour plate method and semi-quantitative analysis by standard loop test for finding significant bacteruria.
15. Plating of clinical specimens on media for isolation, purification, identification and quantitation purposes.
16. Methods for the preservation of bacteria, Maintenance of stock cultures.
17. Tests for motility: hanging drop preparation

Immunology

1. Collection of blood by venipuncture, separation of serum and preservation of serum for shortand long periods.
2. Performance of serological tests viz. Widal, VDRL/RPR
3. Enzyme linked immunosorbant assay: HIV, HBsAg, HCV
4. Latex agglutination tests: RA, CRP,
5. Rapid tests (Immunochromatography or Flow through type) HIV .

Mycology

1. Direct Examination of specimens by KOH, Gram, Kinyoun's, Giemsa, Lactophenol Cotton Blue stains.

Parasitology:

1. Performance of stains – Leishman, Giemsa.
2. Examination of faeces for parasitic ova and cysts etc. by direct and concentration methods(Salt flotation and Formol-Ether methods).

3. Examination of blood for protozoa and helminths by wet mount, thin and thick stained smears.

Virology:

1. Serological tests – ELISA for HIV, HBsAg, HCV

SUGGESTED BOOKS :

- Dr. Praful B. Godkar,Text Books of Medical Laboratory Technology
- Anathanarayana & Panikar – A Text Book of Medical Microbiology
- P. Chakraborthy- A Text Book of Parasitology
- Vasudevan & Shreekumar : Biochemistry for Medical students
- Dacie, Practical Haematology
- K.Laxminarayan : Histological techniques
- Dr. Mukherjee, Medical Laboratory Technology, Volume I , II & II
- Silvertone : Introduction to Medical Lab. Technology
- 1Manual for Clinical Pathology by Sabitry Sanyal
- Harper's Biochemistry